

REMARKS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1-3 and 6-11 are currently pending. No claims have been amended by the present response, and no new matter has been added.

In the outstanding Office Action; Claims 1-3 and 6-11 were rejected under 35 U.S.C. §103(a) as unpatentable over non-patent literature document “High-efficiency white phosphorescent organic light emitting devices with greenish-blue and red emitting layers” to Tokito et al. (hereinafter, “Tokito”) and non-patent literature document “White organic light-emitting diodes from both hole and electron transport layers” to Zuzang et al. (hereinafter, “Zuzang”).

Applicants wish to thank the Examiner for the interview granted to Applicants’ representatives on December 16, 2009, at which time the outstanding rejection of Claim 1 was discussed, as substantially summarized hereinafter. At the end of the discussion, no agreement was reached.

Claim 1 as clarified is directed to an organic electroluminescent device, and recites in part:

a difference in affinity level between the hole barrier layer and the first emitting layer is 0.2 eV or less; and

a difference in affinity level between the hole barrier layer and the second emitting layer is 0.2 eV or less.

Thus, Claim 1 recites in combination the features that were originally claimed separately in Claims 4 and 5 that a difference in affinity level between the hole barrier layer and the first emitting layer is **0.2 eV or less**, and that a difference in affinity level between the hole barrier layer and the second emitting layer is **0.2 eV or less**.

The Office Action acknowledges that Tokito fails to disclose that “a difference in affinity level between the hole barrier layer and the first emitting layer is 0.2 eV or less.”¹ Rather, the Office Action relies on Zuzang for such teachings.

Further, the Office Action asserts that it would have been obvious to a person of ordinary skill in the art to use a hole blocking layer (PBD), used in Zuzang because PBD is a good hole blocking material, instead of the hole blocking material used in Tokito to obtain the claimed difference in affinity level between the hole barrier layer and the first emitting layer being 0.2 eV or less.²

Zuzang describes that a hole blocking layer PBD is used between emission layers SA (i.e., a first emitting layer) and Alq3 (i.e., a second emitting layer).³ Further, Zuzang describes that PBD is used as the hole blocking layer because of good hole blocking effect of PBD.⁴ However, there is no discussion and therefore no disclosure in Zuzang regarding affinity levels of the PBD, the SA, or the Alq3 layers.

Therefore, Zuzang does **not** disclose or suggest that a difference in affinity levels between the PBD layer and the SA layer is 0.2 eV or less.

Further, as described in Table 1 of Applicants' specification, the affinity level of PBD is known to be **2.9 eV**. Also, the affinity level of the CDBP layer, which is used as the emission layers in Tokito, is known to be **2.39 eV**, as described in attached publication WO2008/120714 to Ueno et al. (hereinafter, Ueno). In particular, in paragraph [0104], Ueno describes that the affinity levels of BA1q and CDBP as follows:

Affinity Level of CDBP:	2.39 eV
Affinity Level of BA1q:	2.83 eV

¹ See Office Action dated September 15, 2009, page 3.

² Id.

³ See Zuzang, Fig. 1 and the description thereof.

⁴ Id. at section 3.5.

As asserted by the Office Action, if the hole blocking layer PBD described in Zuzang is used as the hole blocking layer between the CDBP emission layers described in Tokito, then the difference in the affinity level between the hole barrier layer (PBD) and the first emitting layer (CDBP) would be given by:

$$| (\text{Affinity level of CDBP}) - (\text{Affinity level of PBD}) | = | (2.39) - (2.9) | = \mathbf{0.61 \text{ eV}}.$$

Therefore, the difference in the affinity level between Zuzang's hole barrier layer (PBD) and Tokito's first emitting layer (CDBP) is **greater** than 0.2 eV.

No matter how the teachings of Tokito and Zuzang are combined, the combination does not teach or suggest that a difference in affinity level between the hole barrier layer and the first emitting layer is 0.2 eV or less, as recited in Claim 1. In addition, based on analogous reasons as discussed above, any combination of Tokito and Zuzang does not teach or suggest that a difference in affinity level between the hole barrier layer and the second emitting layer is 0.2 eV or less.

Accordingly, Applicants respectfully request that the 35 U.S.C. § 103(a) rejections of Claims 1-3 and 6-11 be withdrawn.

Applicants also submit that the affinity level of the emitting layers depends on the host material of CDBP, and that Ueno's affinity levels of CDBP and BA1q **are determined in the same way** the affinity levels of CDBP and BA1q are determined by Applicants. In this respect, the Examiner's attention is invited to paragraphs [0083]-[0084] of Ueno.

Further, Applicants submit that Applicants and Ueno evaluate an ionization potential with AC-1.⁵ Similarly, Applicants and Ueno calculate affinity levels as

$$A_f = IP - E_g,$$

wherein E_g is an optical band gap calculated from absorption spectrum.⁶

⁵ See, e.g., paragraph [0094] in Applicants' specification, and paragraph [0083] in Ueno.

⁶ See, e.g., paragraph [0094] in Applicants' specification, and paragraph [0084] in Ueno.

Thus, Applicants' evaluation methods for affinity levels and Ueno's evaluation methods for affinity levels are the same as each other.

Finally, for the Examiner's convenience, a translation of Ueno's paragraphs [0083]-[0084] is provided below.

[0083]

(1) Measurement of HOMO: In the present invention, as the value of the highest occupied molecular orbit (HOMO), a work function value measured by a photoelectric spectrophotometer (AC-1, manufactured by Riken Keiki Co., Ltd.) was applied. The measurement of the work function was conducted by the following method. On a glass substrate with an ITO film (manufactured by Sanyo Vacuum Industries Co., Ltd.) which had been cleaned, a material to be measured was formed into a single layer. The work function was determined as an energy value at which photoelectrons were released by means of the above-mentioned photoelectric spectrophotometer AC-1. The measurement was conducted every 0.05 eV at a luminous energy of 50 nW.

[0084]

(2) Measurement of LUMO: In the present invention, the value of the lowest occupied molecular orbit (LUMO) was determined as follows. An energy gap E_g was calculated from the value of an absorption edge of an optical absorption spectrum. The difference between the E_g and the HOMO value as obtained above was determined as the LUMO value. The absorption spectrum was measured by the following method. On a quartz substrate which had been cleaned, a layer formed of a material to be measured was formed into a film. The difference in optical absorption between this substrate provided with a thin film and a quartz substrate as a reference was measured by UV-3100PC (manufactured by Hitachi, Ltd.).

Consequently, in light of the above discussion, the outstanding grounds for rejection are believed to have been overcome. The application is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

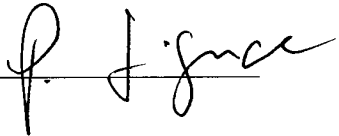
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Attachment: WO2008/120714 to Ueno et al.